

## CLAIMS

What is claimed is:

1. A method for performing a soft hand-off in an ultra-wideband cellular communication system, comprising the steps of:

5 monitoring signal strength and the bit error rate from a primary source;

monitoring signal strength and the bit error rate from a secondary source;

comparing the strength of the signal and the bit error rate from the primary source to the strength of the signal and the bit error rate from the secondary source or to predetermined levels; and

10 transferring data reception and transmission from the primary source to the secondary source when the strength of the signal from the secondary source is greater than the strength of the signal of the primary source or when the bit error rate of the secondary source is less than the bit error rate of the primary source or when either signal strength or bit error rate is below a pre-determined level.

15 2. The method of claim 1, wherein the step of monitoring signal strength and bit error rate from the primary source is performed for at least about 0.5 seconds.

20 3. The method of claim 1, wherein the step of monitoring signal strength and bit error rate from the secondary source is performed for at least about 0.5 seconds.

4. The method of claim 1, wherein the step of monitoring is performed by a mobile unit and/or a base station.

5. The method of claim 1, wherein the bit error rate is about  $10^{-3}$ .

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6. The method of claim 1, wherein the bit error rate is about  $10^{-5}$ .

7. The method of claim 1, wherein the bit error rate is about  $10^{-10}$ .

8. The method of claim 1, wherein the primary source and the secondary source are base stations, wherein the base stations have a hexagonal topology configuration with overlapping coverage; wherein a single base station is connectable to six other base stations for handoff and channel coordination.

9. The method of claim 1, wherein the primary source is a base station, wherein the secondary source is a base station, and wherein each base station is sub-divided into six coverage sectors.

10. The method of claim 1, wherein a base station completes a soft hand-off when a mobile unit moves from one sector to another sector.

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11. The method of claim 1, wherein the hand-off is from a base station to a receiving base station to a mobile unit.

12. The method of claim 1, wherein the primary source is a base station, wherein the secondary source is a base station, and wherein each base station is linked to a plurality of mobile units.

13. The method of claim 1, wherein the soft hand-off is from a mobile unit to a first base station to a second base station, wherein:

the mobile unit is linked to the first base station and detects an increase in bit error rate and/or a reduction in signal strength;

the mobile unit sends a request to the first base station for a hand-off;

the first base station receives the request, selects the second base station and contacts the second base station to request an initial hand-off sequence;

the second base station acknowledges the request for an initial hand-off sequence;

the second base station contacts the mobile unit, provides a channel assignment to the mobile unit and links to the mobile unit;

the mobile unit transmits a hand-off release request to the first base station; and

the first base station releases the mobile unit, and thereby completes the soft hand-

off.

14. The method of claim 1, wherein the soft hand-off involves dynamic power range linking, wherein:

a mobile device is linked to a first base station and requests the position of a plurality of base stations;

5 the plurality of base stations reply;

the mobile unit determines and stores the location of each of the base stations;

each of the base stations transmits an associated rating to the mobile device;

the mobile device calculates the data integrity of each base station and establishes a link with a base station having the highest data integrity; and

10 the mobile device transmits a link curtailment to the first base station.

15 15. A method for performing a soft hand-off in an ultra-wideband code-based cellular communication system, wherein the soft hand-off is from a first mobile unit to a second mobile unit to a base station, the method comprising the steps of:

monitoring signal strength and the bit error rate from a first base station and determining that either is unacceptable;

attempting to locate an adjacent base station with an acceptable signal strength and bit error rate and determining that no adjacent base station has an acceptable signal strength and bit error rate;

20 transmitting a hand-off request from a first mobile device that is linked to the first base station to a second mobile device;

receiving a response from the second mobile device; and

using the second mobile device as a temporary repeater to pass data to a second base station.

16. A computer program product for performing a soft hand-off in an ultra-wideband code-based cellular communication system, comprising:

computer code for monitoring signal strength and the bit error rate from a primary source;

computer code for monitoring signal strength and the bit error rate from a secondary source;

computer code for comparing the strength of the signal and the bit error rate from the primary source to the strength of the signal and the bit error rate from the secondary source or to predetermined levels; and

computer code for transferring data reception and transmission from the primary source to the secondary source when the strength of the signal from the secondary source is greater than the strength of the signal of the primary source or when the bit error rate of the secondary source is less than the bit error rate of the primary source or when either signal strength or bit error rate is below a pre-determined level.

17. The computer program product of claim 16, wherein the soft hand-off is from a mobile unit to a first base station to a second base station, wherein:

the mobile unit is linked to the first base station and detects an increase in bit error rate and/or a reduction in signal strength;

the mobile unit sends a request to the first base station for a hand-off;

the first base station receives the request, selects the second base station and contacts the second base station to request an initial hand-off sequence;

the second base station acknowledges the request for an initial hand-off sequence,

the second base station contacts the mobile unit, provides a channel assignment to the mobile unit and links to the mobile unit

the mobile unit transmits a hand-off release request to the first base station; and

the first base station releases the mobile unit, and thereby completes the soft hand-off.

18. The computer program product of claim 17, wherein the channel comprises at least one of a sequence code in a code-division multiple access (CDMA) scheme, and an ultra-wideband radio channel.

19. The computer program product of claim 16, wherein the soft hand-off involves dynamic power range linking, wherein:

a mobile device is linked to a first base station and requests the position of a plurality of base stations;

the plurality of base stations reply;

the mobile unit determines and stores the location of each of the base stations;

each of the base stations transmits an associated rating to the mobile device;

the mobile device calculates the data integrity of each base station and establishes a link with a base station having the highest data integrity; and

the mobile device transmits a link curtailment to the first base station.

20. A computer program product for performing a soft hand-off in an ultra-wideband code-based cellular communication system, wherein the soft hand-off is from a first mobile unit to a second mobile unit to a base station, comprising:

5 computer code for monitoring signal strength and the bit error rate from a first base station and determining that either is unacceptable;

computer code for attempting to locate an adjacent base station with an acceptable signal strength and bit error rate and determining that no adjacent base station has an acceptable signal strength and bit error rate;

10 computer code for transmitting a hand-off request from a first mobile device that is linked to the first base station to a second mobile device;

computer code for receiving a response from the second mobile device; and

15 computer code for using the second mobile device as a temporary repeater to pass data to a second base station.

21. A system for performing a soft hand-off in an ultra-wideband code-based cellular communication system, wherein the soft hand-off is from a first mobile unit to a second mobile unit to a base station, the system comprising:

20 means for monitoring signal strength and the bit error rate from a first base station and determining that either is unacceptable;

means for attempting to locate an adjacent base station with an acceptable signal strength and bit error rate and determining that no adjacent base station has an acceptable signal strength and bit error rate;

means for transmitting a hand-off request from a first mobile device that is linked to the first base station to a second mobile device;

means for receiving a response from the second mobile device; and

means for using the second mobile device as a temporary repeater to pass data to a second base station.

22. A mobile unit for an ultra-wideband code-based cellular communication system, wherein mobile unit performs a soft hand-off to a second mobile unit to a base station, the mobile unit comprising:

means for monitoring signal strength and the bit error rate from a first base station to which it is linked and determining that either is unacceptable;

means for attempting to locate an adjacent base station with an acceptable signal strength and bit error rate and determining that no adjacent base station has an acceptable signal strength and bit error rate;

means for transmitting a hand-off request to a second mobile device;

means for receiving a response from the second mobile device; and

means for using the second mobile device as a temporary repeater to pass data to a second base station.

23. A base station for an ultra-wideband code based cellular communication system comprising

means for monitoring signal strength and the bit error rate from the base station, which serves as a primary source;

means for comparing the strength of the signal and the bit error rate from the primary source to predetermined levels; and

means for transferring data reception and transmission to a secondary source.

5           24.     The base station of claim 23, wherein the soft hand-off is from a mobile unit to the base station to a second base station, wherein:

the mobile unit is linked to the base station and detects an increase in bit error rate and/or a reduction in signal strength;

the mobile unit sends a request to the base station for a hand-off;

10           the base station receives the request, selects the second base station and contacts the second base station to request an initial hand-off sequence;

the second base station acknowledges the request for an initial hand-off sequence;

15           the second base station contacts the mobile unit, provides a channel assignment to the mobile unit and links to the mobile unit;

the mobile unit transmits a hand-off release request to the base station; and

the base station releases the mobile unit, and thereby completes the soft hand-off.

20           25.     The base station of claim 23, wherein the soft hand-off involves dynamic power range linking, wherein:

a mobile device is linked to a the base station and requests the position of a plurality of base stations;

the plurality of base stations reply;

the mobile unit determines and stores the location of each of the base stations;

each of the base stations transmits an associated rating to the mobile device;  
the mobile device calculates the data integrity of each base station and establishes  
a link with a base station having the highest data integrity; and  
the mobile device transmits a link curtailment to the base station.

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26. A base station system for an ultra-wideband code-based cellular  
communication system, wherein there is a soft hand-off from a first mobile unit to a  
second mobile unit to the base station, the base station comprising:

means for monitoring signal strength and the bit error rate from the first base  
station and determining that either is unacceptable; and

means for attempting to locate an adjacent base station with an acceptable signal  
strength and bit error rate and determining that no adjacent base station has an acceptable  
signal strength and bit error rate.